# Military Demand for Oil In the Soviet Union

An Intelligence Assessment



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# Military Demand for Oil In the Soviet Union

*Central Intelligence Agency*
*National Foreign Assessment Center*

*September 1978*

## *Key Judgments*

We estimate that in 1977 the Soviet armed forces consumed 13 million to 14 million metric tons of petroleum-based fuels and lubricants (POL) to operate their aircraft, ships, submarines, land arms, and ground vehicles. This was 2 to 3 percent of the Soviet petroleum production for that year and 3 to 4 percent of the refined petroleum consumed domestically. From 1965 to the present, military consumption of oil is estimated to have grown slowly, about 2 percent annually, and the patterns of its use by weapon system and by military service have remained relatively stable. About 70 percent of the total is jet fuel for aircraft operation. Fuels for ships and ground vehicles and lubricants for all systems make up considerably smaller shares.

The Air Forces use nearly 50 percent of all Soviet military POL, the Air Defense Forces and Navy use about 20 percent each, and the ground and other forces combined use 10 percent. We estimate that about 75 percent of these POL requirements are allocated to conventional forces and support missions, 20 percent to strategic defense forces, and only about 5 percent to elements with intercontinental and peripheral attack missions.

The Soviet military does not appear to have been seriously troubled by petroleum shortages over the past decade. The nation at large has suffered a rash of oil supply problems since mid-1976, but most military units have had enough POL for day-to-day needs. Occasional spot shortages are common, however. The Ministry of Defense appears to have stepped up its propaganda urging fuel conservation, but it has not adopted any new conservation measures of substance.

Military POL consumed in 1977 cost about 750 million rubles (in 1970 prices)—we estimate this to be less than 2 percent of total Soviet spending for defense. In dollar terms the POL was worth approximately $1.8 billion. In comparison, the US armed forces consumed about 19.8 million metric tons of POL in 1977, and its cost was about 2 percent of the US defense budget. That POL was almost 5 percent of US petroleum production and slightly more than 2 percent of total US consumption.

If current trends in force growth and operating rates continue, we project that the Soviet military will continue to use about 2 percent more POL each year and will be consuming 15 million to 16 million metric tons of POL by 1985. This growth rate, which continues that of the past decade, is well below the growth rates for domestic oil production and consumption in the USSR from 1965 to 1977 and is slightly less than the military growth rates we expect through 1980.

We see a strong likelihood of future national oil supply problems, but we believe the Soviets will not reduce military POL consumption appreciably through the middle 1980s. By growing no faster than in the past, the armed forces' requirements for oil should impose no greater burden on national resources than they do now. Moreover, to save enough petroleum to affect the Soviet economy, the military would have to cut its forces and weapons inventories and decrease the rate—already low—at which it operates its equipment. These actions would require major policy shifts of a kind that the Soviets have been generally unwilling to make in the past.

# PREFACE

This assessment presents estimates of the current levels and trends of oil consumption by the Soviet military [1] and future requirements through 1985. It focuses on whether the military is likely to reduce its use of petroleum if the Soviet Union should experience a tightening oil supply situation through the 1980s.

This assessment covers POL consumed directly by the Soviet military in naval, ground, and air activities on a routine and day-to-day basis. These products include jet fuel, marine and automotive diesel fuel, automotive and aviation gasoline, marine fuel oil (*flotskii mazut*, a heavy, low-sulfur fuel oil), and lubricating oils and greases.

The POL consumption estimate discussed in this report omits:

a) Strategic reserves. Although these probably contain enough POL to support major offensive operations for several months along one or more fronts, additions to reserves are probably only a small portion of total year-to-year military POL requirements.

b) Wartime requirements.

c) Fuel burned to generate electricity, to heat buildings, and to power such nonvehicular equipment as fixed radar sets. Analysis of Soviet practices (and comparison with our own) suggests that such use probably constitutes less than 15 percent of the armed forces' total direct oil consumption.

d) Consumption by other organizations in providing goods and services purchased by the military. This includes defense industry consumption, which is probably the only sizable military-related use of POL not covered in this analysis.

e) Petroleum derivatives used as construction materials (tar, asphalt, and the like) in military facilities and roads, as well as fuels and lubricants used in civilian construction equipment engaged in building them. (We do, however, include POL used to operate equipment of the Construction Troops.)

f) Diesel fuel for military railroad operation; the amount is probably trivial, because the Ministry of Railways provides most routine rail

[1] For this analysis we define the Soviet military (or armed forces) to include the Ground, Air, Air Defense, and Strategic Rocket Forces, the Navy, all elements of the Ministry of Defense, the KGB Border Guards and Signal Troops, and the Internal Troops of the Ministry of Internal Affairs (MVD). For a discussion of these categories, see *Trends in Soviet Military Manpower*, [redacted] September 1977, Secret.

transport. The armed forces operate mainly small switching equipment.

g) Various other petroleum derivatives such as cleaning solvents, lamp kerosene, deicing fluid, and antifreeze. The Soviet military appears to use relatively little of these products.

We have not measured actual Soviet POL consumption. We derived the estimates and projections presented in this report by simulating the probable military requirements through a series of mathematical and computer models, which approximate what we believe to be the Soviets' own formulas for estimating their petroleum needs. These formulas use such information as order-of-battle estimates, equipment inventories, operating levels, and fuel and lubricant consumption rates.

In general, our estimates should be regarded as relatively accurate for the middle and late 1970s, the period for which our input data are best. Our estimates of operating rates and equipment inventories are less certain for earlier years. Least certain are the estimates of future consumption, because the order-of-battle and operating rate projections that support them have a fairly large margin of error.

These estimates are a product of ongoing research into the cost and resource implications of Soviet defense programs. The results of this overall effort are summarized periodically in comparative estimates of US and Soviet military activities and spending.[2]

The information cutoff date for this analysis is 31 May 1978.

[2] See *A Dollar Cost Comparison of Soviet and US Defense Activities, 1967-77*, SR 78-10002, January 1978, Unclassified, and *Estimated Soviet Defense Spending: Trends and Prospects*, SR 78-10121, June 1978, Unclassified.

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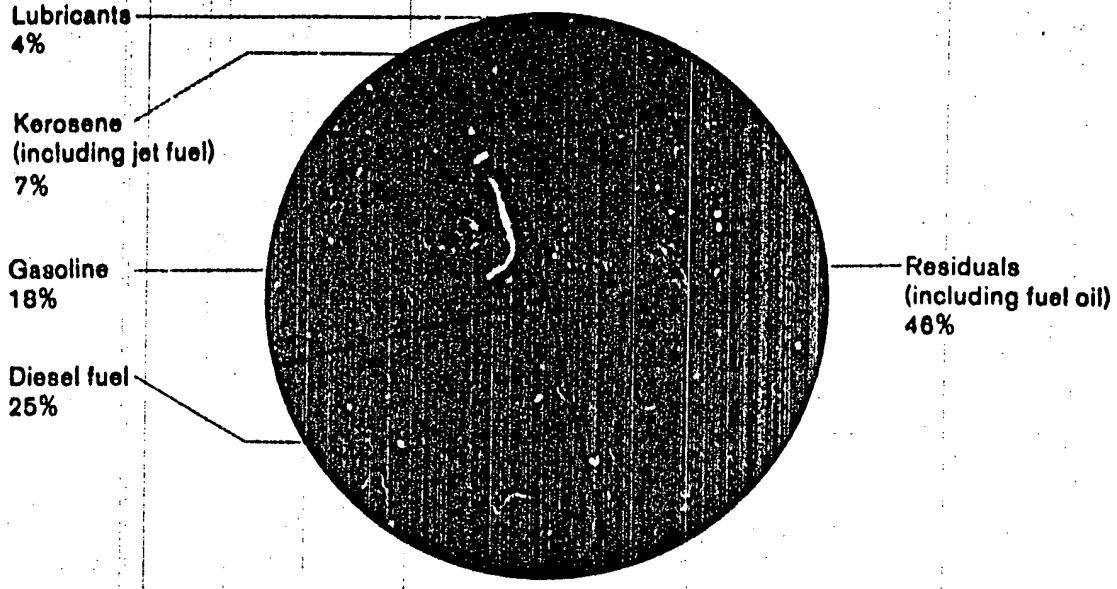
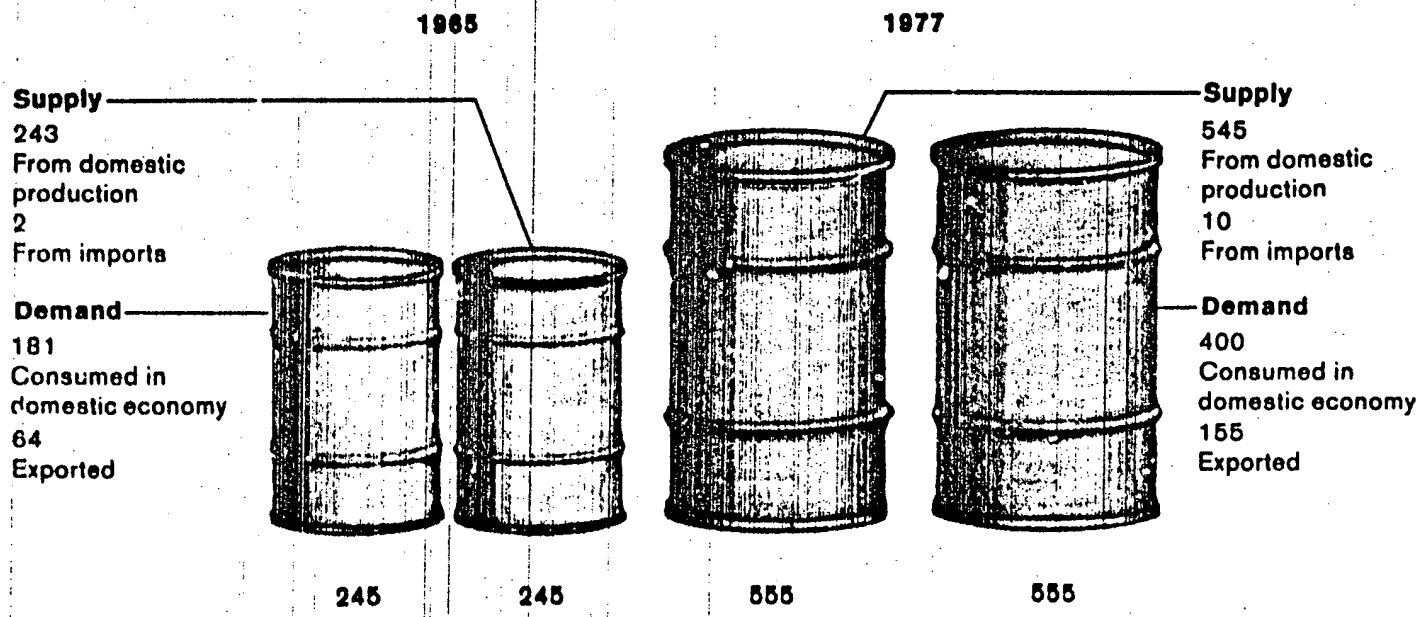
**Domestic Consumption Pattern, mid-1970s**




**Annual Supply and Demand**
**(in million metric tons)**



# Military Demand for Oil In the Soviet Union

## Background

### National Petroleum Supplies and Consumption

The Soviet Union produces more oil than any other country in the world. In 1977 its annual oil supply was 555 million metric tons, of which some 545 were produced domestically. In that year the internal demand was only about 400 million metric tons, and the rest of the oil was exported (see figure 1). Almost half of current Soviet oil consumption is composed of residual products,[3] including heavy fuel oils *(mazut)*. Diesel fuels (about 25 percent of annual consumption) and gasoline (slightly under 20 percent) are also important. Kerosene (this category includes jet fuel) and lubricants account for the rest of domestic consumption.

From 1965 to 1977, production and consumption grew in the USSR at rates averaging about 6 to 7 percent annually; in 1978, however, the growth appears to be slowing. We anticipate that by the beginning of the 1980s the growth rate for both will be less than 3 percent. The Soviets should continue to be able to satisfy their own petroleum requirements and most of those of their allies in Eastern Europe for several more years. By the mid-1980s the USSR might be forced to curtail exports in order to meet internal demand.

Since 1976 we have seen increased indications of fuel supply problems in the USSR. Many civilian enterprises and some military units have complained of spot shortages of petroleum, particularly diesel fuel and gasoline. The shortages apparently are due more to structural problems[4] than to resource scarcity, but several other factors may be involved as well. Soviet planners may have overestimated both the size and the availability of Siberian reserves and underestimated fuel requirements for recent agricultural harvests and industrial activities. Poor planning in general, plus an increasing government reliance on the sale of oil as a way of gaining badly needed hard currency, may also contribute to these shortages.

### Military Petroleum Consumption

*Determining Factors.* The Soviet armed forces consume a full range of petroleum products to operate their ships, submarines, aircraft, land armaments, and automotive vehicles. In any given year, requirements for military POL are determined chiefly by the equipment in use—the kind and amount, the fuel-consuming characteristics, and the rate at which the Soviets operate it.

Certain other factors are also important drivers of Soviet POL needs:

- Geography. The armed forces of the Soviet Union are dispersed over one-sixth of the land surface of the earth. In much of the area, rugged terrain, climatic extremes, and limited transportation increase the energy requirements for operations.
- Size of the armed forces. More than 4 million men (double the strength of the US military) in at least 5,000 separate military installa-

[3] The category of residuals includes all petroleum products other than gasoline, diesel fuel, kerosene, and lubricating oil. A good portion of residuals are used as raw materials for manufactured products rather than as energy sources.

[4] A "structural shortage" is a temporary dislocation in supplies resulting from inadequacies in planning or technical problems in production or distribution. The Soviet economy is plagued by such shortages, which must be differentiated from permanent resource shortages.

tions in the USSR alone would challenge any military logistic system.

- Strategic and tactical doctrine. The Soviets stress mobility, rapid advance, and heavy firepower; these require peacetime exercises and training which use up much of the POL that might otherwise be saved by the low day-to-day operating rates for equipment.

*Allocation of POL.* The Soviet military carefully plans its logistic needs, including petroleum requirements, on a quarterly and yearly basis and merges them in its five-year plan. These projections ultimately become part of the plans for the civilian ministries that supply petroleum. Calculations supporting the military plans are made by fuel supply and finance officers in the Rear Services, in consultation with line commanders.

Soviet military and civilian handbooks show us how the officer calculates his unit's POL requirements for one accounting period. He lists all the equipment, the fuel and lubricant consumption rates for each type of equipment, and the rate at which the unit intends to operate each type. After multiplying these figures, he adjusts the total POL requirement by a set of factors to account for evaporation, waste, maintenance running, climate, and—presumably—pilferage.

*Organization and Management.* Within the Soviet armed forces, POL acquisition, handling, and distribution are managed by the Fuel Supply Directorate of the Rear Services. At each echelon—military district or fleet, army or naval base, division, and regiment—a fuel supply officer, who is subordinate to the deputy commander for rear services, is in charge of POL-associated personnel and operations. The directorate maintains storage and supply depots for petroleum down through the battalion level.

For peacetime operations, the fuel supply officers of most military units purchase their POL directly from civilian depots in the area, which also supply industrial and commercial users. The military and the civilian enterprises pay the same "industry-wholesale" prices for bulk petroleum products, but the military has first priority.

Transportation companies and motor transport battalions and regiments move the POL from the point of initial supply to the consumer units, usually by truck or rail. The armed forces provide the containers. Supply and maintenance platoons, or their equivalents, handle the final distribution. During a military action or a major training exercise, pipeline brigades augment this supply system by laying pipelines from rear supply points to front-line combat units.

Norms for the management and control of petroleum stocks at the unit level are, on paper at least, explicit and strict. Regulations specify how the stocks must be stored and handled. The POL consumed is controlled by means of coupon books and equipment logs and must be accounted for on a daily basis.

*Conservation and Waste.* The Soviet military regards petroleum as second only to ammunition in logistic importance and places great stress on its efficient use and conservation. Measures intended to keep consumption low include:

- Limiting the use of POL wherever substitutes are available. For example, to avoid using antifreeze, the Soviets commonly use water in vehicle radiators and drain them to prevent freezing.
- Keeping equipment operating rates low.
- Restricting POL consumption to planned quarterly and annual levels, curtailing operations if the allotment is used up before the end of the accounting period, and requiring that overages be made up out of future allotments.
- Rewarding individual servicemen for conspicuous fuel savings, rebuking fuel wasters by name, and bombarding all the troops with propaganda and slogans like "Take care of the drops, the tons will take care of themselves."

These measures seem to hold military POL consumption to the planned levels, but they do not guarantee efficient use. In military journals, articles advocating fuel conservation pointedly avoid recommending any change in the nature,

number, or quality of military operations. If overall supplies run short, the planners seldom reduce military POL allocations; instead, they require the civilian suppliers of petroleum to make up in later deliveries any shortfalls in the allocations. On the other hand, if a military unit has unused POL at the end of the accounting period, it can "write it off" rather than applying it to reduce the draw for the next period. Finally, the planning factors used to compute POL requirements allow generously for "excess use."[5]

As much as 10 percent[6] of total armed forces petroleum consumption is accounted for as "excess use." Some of this "excess use" is unavoidable, but much of it appears to be caused by correctable factors such as theft and improper handling. For example, [redacted] have indicated that within the Soviet armed forces POL is an attractive item to be stolen for barter and makes an assignment to a fuel supply depot highly desirable. Soviet military procedures for both operational and stored equipment require checking fuel frequently for contamination or deterioration, as well as an inordinate amount of topping off, emptying, and refilling of fuel tanks. This constant handling, often under relatively primitive conditions, increases the chance of spillage and waste as well as the opportunity for theft. Military authorities seem to ignore much of this loss, writing it off as "evaporation."

*Shortages.* The Soviet military does not seem to have been seriously troubled by petroleum shortages over the past decade. [redacted] mention only occasional spot shortages of the type that any military unit may encounter, particularly when operating in a remote area. Such deficiencies, which arise from structural problems in the national supply, are fairly commonplace for most resources in the Soviet Union. When they occur, however, they can cause serious local problems.

Shortages of the type most frequently encountered usually involve gasoline and diesel fuel—items for which the USSR has never had enough refinery capacity. Because operational POL is supplied by civilian depots, many of the reported military deficiencies may reflect temporary civilian shortages passed on to the armed forces. In addition, military units frequently provide manpower and material to civilian agriculture and industry, and this also seems to cause some fuel deficiencies.

Printed rhetoric urging fuel conservation in the military appears to have increased in volume since 1977, but the Ministry of Defense does not appear to have taken any additional concrete actions to reduce its fuel consumption. The official party slogans released to the military in 1977 for the 60th anniversary of the revolution gave equal billing to the conservation of fuel and other material resources—a continuation of past treatment of the subject.

## Estimated Military Oil Demand

### The Military as an Oil Consumer

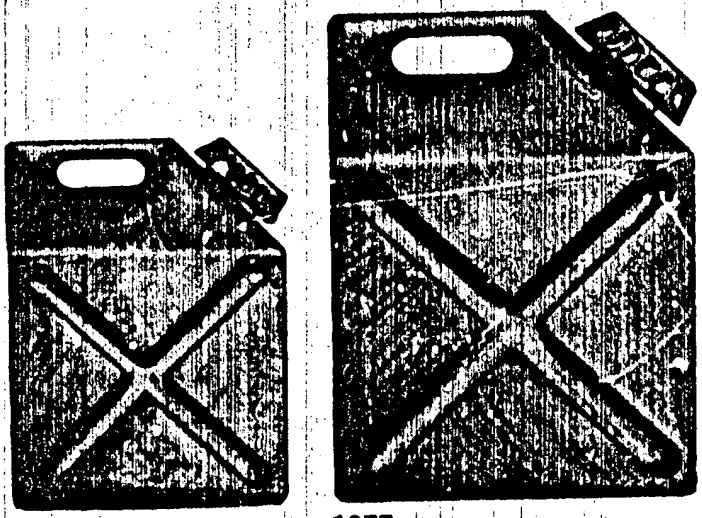
We estimate that the Soviet armed forces consumed 13 million to 14 million metric tons of POL in 1977 to operate their equipment; this was 2 to 3 percent of national oil production and 3 to 4 percent of consumption for that year (see figure 2). Direct military requirements for oil in mid-1978 are probably about one-third higher than they were in 1965. These increased requirements are primarily the result of the increased size of the armed forces and the introduction of higher performance equipment that uses more fuel.

From 1965 to 1977, Soviet military consumption of petroleum appears to have grown at an annual rate of slightly more than 2 percent. This was about one-third of the rate of growth for

[5] "Excess use" refers to the difference between the quantity of POL allotted or procured and the amount whose use can be actually accounted for in operations. Military planning of POL use, like the overall Soviet economic planning, must be rigid because it brings supply and demand into balance through nonmarket mechanisms. Even minor deviations from the plan by any of the organizations operating under it can have a rippling effect throughout the economy. To help this rigidity adapt to the real world, the Soviets tend to build slack into their planning.

[6] We derive this figure from Soviet military journals and from published norms and statistics for fuel losses. In comparison, according to the US Defense Fuel Supply Center, the US military loses less than 1 percent, mostly because of normal expansion and contraction.

**Figure 2. Estimated Annual Consumption of POL by the Soviet Armed Forces**



**1965**
10 to 11 million metric tons

**1977**
13 to 14 million metric tons

**Annual POL requirements to operate military aircraft, ships, land arms, and vehicles.**

total domestic consumption and production of oil. Therefore, although military consumption is substantially greater than it was, it probably is a slightly smaller share of national consumption than it was in 1965 and uses somewhat less of the national supply of petroleum. Consequently, in terms of direct use, the Soviet military has become a proportionately less significant consumer of oil.

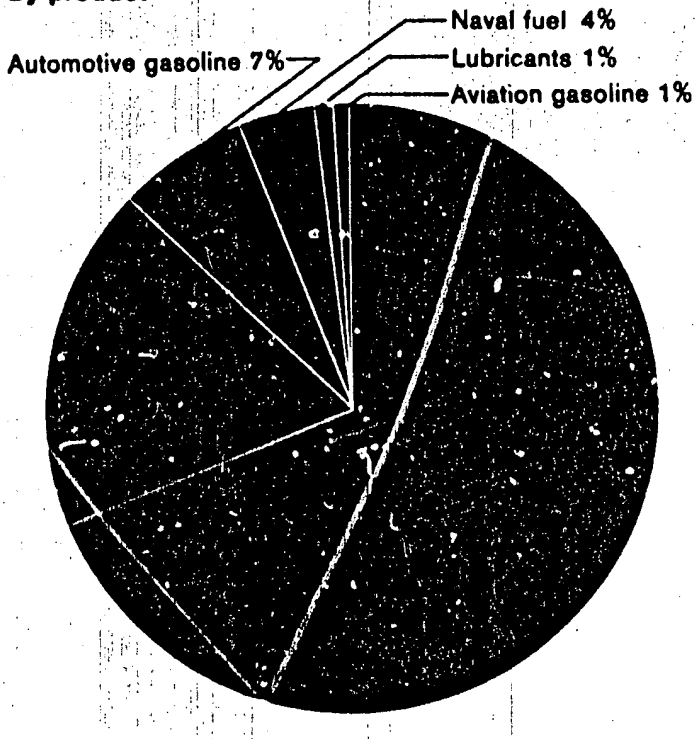
### Military Consumption Patterns

*By End Use and by Product.* Of the 13 to 14 million metric tons of POL consumed in 1977, we estimate that more than two-thirds were used to operate aircraft. The remainder was consumed in about equal shares by vehicles and land arms (16 percent) and by ships and submarines (14 percent), as shown in figure 3. The Soviet mili-

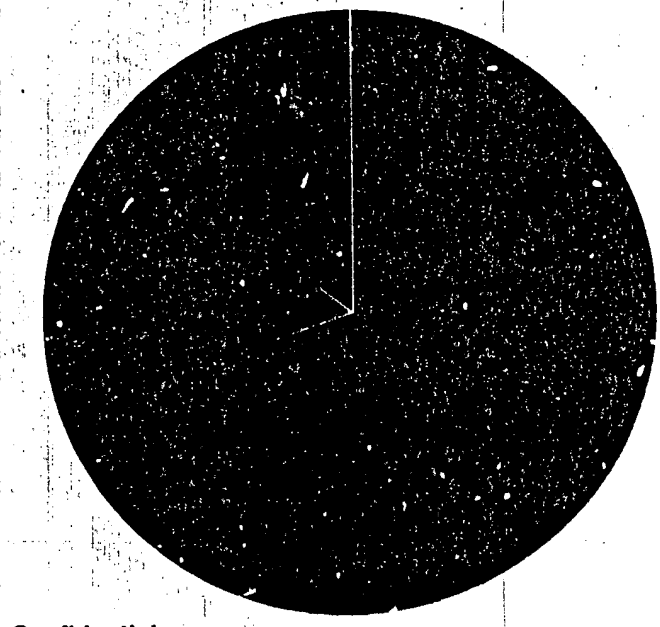
**Figure 3. Estimated Soviet Military POL Consumption by Product and Use, 1977**

Direct military oil consumption in 1977 is estimated at 13 to 14 million metric tons.

**By product**




**By use**



tary consumed 9 to 10 million metric tons of jet fuel in 1977—over one-third of the national kerosene production. In contrast, the military consumes an almost negligible amount of aviation gasoline.

Less than 20 percent of military requirements were for diesel fuels. Automotive gasoline, still the principal fuel of the military truck fleet in the USSR, accounted for under 10 percent. Naval fuel oil (*flotskii mazut*) probably represented not quite 5 percent and lubricants about 1 percent.

Since 1965, the pattern of Soviet armed forces consumption of petroleum appears to have shifted heavily toward jet fuel, the result of rapid expansion and modernization of aircraft inventories. Demand for diesel fuels and gasoline has increased in absolute terms, but at nowhere near the rate for aviation jet fuel. Demand for naval fuel oil has declined—a consequence of the retirement of many large, obsolete *mazut*-burning ships and the introduction of more efficient distillate-powered units.

Except for kerosene-based jet fuel, the Soviet armed forces do not appear to be taking a disproportionate share of any one petroleum product from the economy. Military use accounted for about 3 percent of national consumption of diesel fuel and probably less than 2 percent of the other POL products.

*By Force and Mission.* The Soviet Air Forces (Frontal Aviation, Long Range Aviation, and Transport Aviation) appear to account for about one-half of all POL currently consumed by the military. The other elements of the armed forces consume much smaller shares (see figure 4).

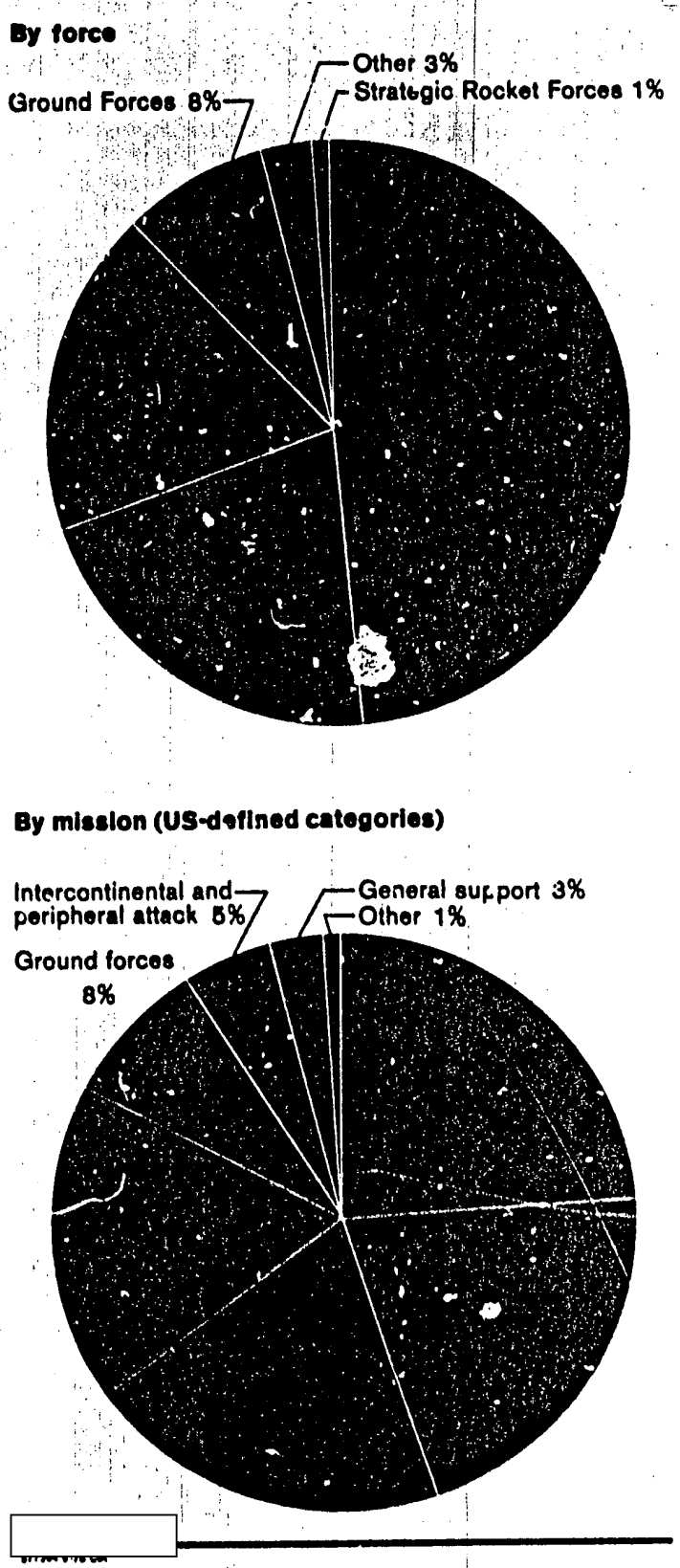
When we analyze current Soviet military POL consumption by mission (as the US military defines missions), it becomes clear that the bulk of it is driven by conventional forces and support activities. A major reduction in Soviet strategic arms would not mean major oil savings.

### The Cost of Military POL

We estimate that the Soviet military spent approximately 750 million rubles in 1977 for

**Figure 4. Estimated Soviet Military POL Consumption by Force and Mission, 1977**

Direct military oil consumption in 1977 is estimated at 13 to 14 million metric tons.



POL, about 25 percent more than in 1965.[1] (This is equivalent, when measured in 1977 US prices as paid by the Department of Defense, to about $1.8 billion.)

About 60 percent of current Soviet expenditures (valued in rubles) for military POL appears to be devoted to jet fuel for aircraft. The price of jet fuel relative to that of other fuels is much lower in the USSR than in the United States, and this lessens the economic burden of aircraft operations on the Defense Ministry budget.

Military consumption of POL appears to have accounted for a fairly small, constant share—less than 2 percent—of Soviet defense costs from 1965 to 1977. Over this period armed forces petroleum requirements grew only slightly, and product prices remained relatively stable.

Throughout the 1970s the Soviet Ministry of Defense seems to have experienced little if any petroleum cost pressure. Ample domestic oil supplies in the USSR and the centrally fixed and artificially stabilized price system have kept costs to the military low.

An increase in the wholesale price of gasoline, announced by the Soviets as part of a general price revision early in 1978, probably will not significantly alter the relative standing of petroleum expenditures in the defense budget. Gasoline appears to account for 10 to 15 percent of current military POL costs (measured in 1970 rubles). Even though the price for gasoline has doubled, total POL expenditures should rise by no more than 10 percent.

### Comparison with US Military Consumption

According to data supplied by the Defense Fuel Supply Center, the US armed services consumed approximately 19.8 million metric tons of POL in 1977.[2] This was slightly more than 2 percent of total US domestic consumption of oil for that year; it was almost 5 percent of US production of petroleum. US military consumption of oil has decreased sharply since the early 1970s, the result partly of the decrease in force levels since the Vietnam war and partly of a concerted effort at energy conservation. Nevertheless, the US military is currently using about 45 percent more POL than the Soviet military.

The difference can be explained primarily by the rates at which the two armed forces operate their equipment. The ground forces of both nations operate their vehicles and land arms at relatively comparable rates, and the disparity in the annual POL consumption for ground forces is not large, but some US aircraft and ships are operated several times as much as the comparable Soviet systems.

In general, the current pattern of direct POL consumption by the US military is similar to what we have found for the Soviets (see figure 5). For example, 72 percent of annual US consumption is jet fuel and 21 percent is distillate (predominantly diesel) fuels—almost the same proportions as for the Soviet armed forces. About 4 percent of US consumption is made up of automotive gasoline, a somewhat smaller share than for the Soviets, who still rely heavily on gasoline-powered trucks. The remaining US products each account for about 1 percent of the total. Their rank—navy special fuel oil, aviation gasoline, and lubricants, in descending order—is the same as that of their Soviet counterparts.

Considered by service, the US consumption pattern also bears a strong resemblance to the Soviet. In 1977 the US Air Force consumed about 59 percent of all POL used by the military. The Navy burned about 32 percent (with as much as one-third of this being used in aircraft). The Army and Marine Corps together took around 9 percent of total requirements.

The cost of POL to the US Department of Defense was about $3 billion in 1977—more than 2 percent of the Pentagon budget. Soviet consumption in 1977 was equivalent to $1.8 billion—less than 2 percent of estimated defense spending in the USSR. Unlike the Soviet Ministry of Defense, the US Department of Defense

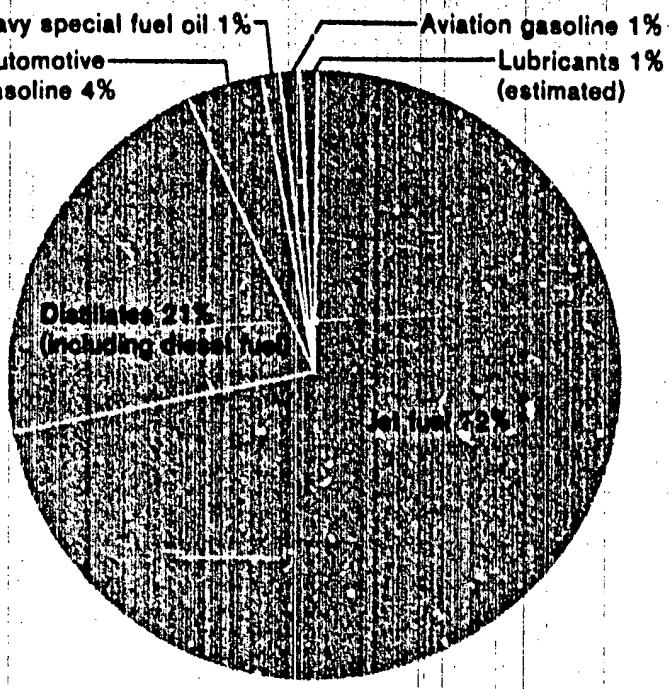
[1] The figures for both years are calculated in constant 1970 prices for bulk petroleum products purchased wholesale in the Moscow area. The price schedule for refined oil products in the USSR remained largely unchanged until a gasoline price revision in early 1978.

[2] This figure would total 22.7 million tons if burner fuel oils for US military heating plants and generators were included.

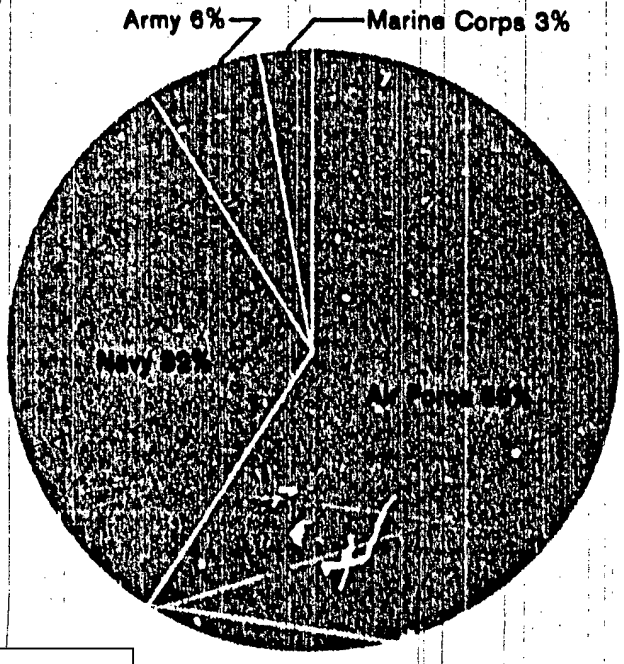
**Figure 5. US Military POL Consumption, 1977**

**Annual military oil consumption is 19.8 million metric tons.**

**By product**




**By service**




has been subject to heavy cost pressures in the petroleum market since the early 1970s. Although the United States has markedly decreased its military POL use over the past five years, the cost of its POL in current prices has steadily risen.

**Prospects**

We estimate that by 1985 the Soviet armed forces will be consuming 15 to 16 million metric tons of POL annually, if they develop as the US Intelligence Community currently predicts and if they do not change their POL management practices and their equipment operating rates. This increase from the current 13 to 14 million tons represents an average annual growth rate from 1977 to 1985 of a little under 2 percent—a bit less than that for the previous decade.

Soviet military requirements for petroleum are unlikely to increase beyond levels dictated by force growth. To a large measure, POL consumption is determined by equipment operating practices—which, in turn, are functions of Soviet military doctrine, force size and activity levels, training procedures, hardware procurement decisions, and maintenance and logistic capabilities. We have no evidence that Soviet military leaders are sufficiently dissatisfied with these operating practices to make rapid or major changes in the factors which determine them.

Further, we do not believe that the Soviet Union will have incentive to reduce its rate of military petroleum consumption significantly or to reverse the modest growth trend. This judgment is based on the following considerations:

- The Soviet economy appears to have comfortably supported the military petroleum demand in the past. We do not expect armed forces oil requirements to increase relative to those of other sectors or to outpace domestic production capability, and we assume the Soviet military should have no new difficulty in satisfying its POL needs.
- The current military demand for petroleum is relatively so small that any foreseeable cut would release little oil to civilian consumers.

- The military has high priority in the Soviet economy and probably would not be forced to make major sacrifices unless all other alternatives had been exhausted.
- The annual cost of petroleum appears to be only a small share of defense costs and probably will remain so even after the recent gasoline price increase. It seems unlikely that oil conservation would be undertaken for financial reasons.
- We expect that the largest Soviet military POL requirement will continue to be jet fuel, which is easy to refine and poses fewer supply problems in the USSR than do many other petroleum products.

The Soviet armed forces might, of course, be motivated toward some modest oil conservation—no more than 5 to 10 percent of projected requirements—particularly if the nation's leaders perceived that the familiar spot shortages were increasing or that a genuine oil shortage were at hand. The conservation efforts would most likely be directed toward lowering consumption just enough to ensure that military needs could be met out of actual petroleum supplies. No fundamental change would be needed—simply tighter controls over fuel handling and use and better incentives to efficient management.

Although the military leaders are aware that these marginal savings are potentially available, they have had little success in realizing them in the past. There is no indication to date that the Ministry of Defense is planning to implement a conservation program of even this size.

To conserve more than 5 to 10 percent annually, the Soviet military would have to eliminate virtually all "excess use" of oil, operate some equipment less often, and, ultimately, cut the size of the forces and the amount of their equipment. There is no current reason to believe that the Soviet Union will do so.

*Comments and queries regarding this publication are welcome. They may be addressed to*

[redacted] *Office of Strategic Research, on*

[redacted]